Abstract

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Title: **Mars Comm/Nav MicroSat Network Using the Multi-Mission Bus Launched Piggyback by Ariane 5**

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Recently, NASA's Jet Propulsion Laboratory completed a Mars Exploration Program Architecture Definition Study with strong international participation. The recommendations of this study include establishment of a low cost *in-situ* communications and navigation satellite network to provide enabling and enhancing support for the international exploration of Mars. This would be the first step toward establishing a "virtual presence throughout the solar system" as called for in NASA's Strategic Plan.

Response to the proposed comm/nav satellite network has been very favorably received, as reflected by the inclusion of a line item in NASA's budget submittal to Congress, which provides funding for implementation of the network with first launch in the 2003 opportunity. Funding has already been provided for a phase A study being conducted this year.

This paper presents the planned implementation of the comm/nav network, which will utilize microsats based on a multi-mission spacecraft bus being designed for launch by the Ariane 5 as a secondary payload. A companion paper at this conference, entitled "The Multi-Purpose Mars Micro-Mission System Design Utilizing Ariane 5 Piggyback Launch", describes the multi-mission bus design. This paper addresses the application of the multi-mission bus to the comm/nav microsat mission.

Following an introduction, which provides the background that has led to the proposed comm/nav network, the paper discusses the projected user needs with emphasis on the various possible robotic missions (landers, rovers, ascent vehicles, balloons, aircraft, etc.) progressing toward eventual piloted missions.

Next, the paper describes the concept for an evolving network of comm/nav microsats and the expected capability to satisfy the user needs. Results of communications and navigation performance analysis are summarized for attractive satellite constellation configurations.

The important comm/nav microsat functional requirements on the multi-mission spacecraft bus are described with discussion of the mission-system tradeoffs for the driving requirements. The functional design of the *in-situ* communications / navigation package, which constitutes the payload of the microsat, is also described.

The paper also includes discussion of technologies which are of specific importance to the implementation of the comm/nav microsat network.